"Towards an Earth-Moon Economy Developing Off-Planet Resources"

Moon Miners' Manifesto

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In FOCUS: Economic Case for Mars

And from that, many things follow.

Editorial by Peter Kokh

Turf retentives on both sides miss the point. *Neither frontier will be viable without the other.* Both frontiers will be under the gun to produce, and sell, enough exports to pay for importing what they cannot (yet) produce locally. Earth will remain the most expensive source of imports, simply because it sits at the bottom of a comparatively deep gravity well. If some of the import needs of the Moon can be met from the very shallow gravity wells of Mars two mini moons, Phobos and Deimos, and others from the intermediate gravity well of Mars itself, that will alleviate import cost pressures on the Moon. Conversely, if some of the import needs of Mars, and its moons, can be met from lunar sources, that will reduce import bills for the Martian frontier. In short, the viability prospects for both frontiers seem much rosier if they develop side-by-side than if only one is developed.

First, the Moon. There *are* sources of volatiles on the Moon, and not just at the poles. Hydrogen, nitrogen, and carbon can be had in at least minimal quantities for the price of the mindset of gas scavenging practiced *de riguer.*

Requires the Moon as Trading Partner

The upper two yards/meters of the lunar regolith contains these gases, the gift of eons of bombardment of the Moon's surface by the solar wind, trapped by adhesion to the fine dust particles. If, *whenever we move regolith in the process of construction, road building, mining, etc.,* we heat it up to release these gases, trap and separate them, *we shall not want.* That said, we may want more. Having to be always stingy and Spartan in our lifestyle habits can be dampening. There is likely more at the poles, but we do not know yet how easy or difficult it will be to retrieve it.

Yet, these volatiles may also exist abundantly on Phobos and/or Deimos (it is beyond understanding why NASA, any other agency, *or even the Mars Society itself*) has not prioritized missions to both of these Moons.) In that case, they could be extracted, and refined for efficient shipment, as methane CH_4 and ammonia NH_3. If needed, these volatiles could be shipped much more cheaply from Mars' moonlets than from Earth.

Mars has had at least some hydro-tectonic ore-enrichment, whereas on the Moon, such geological processes never got started. Should we not find the lunar equivalent of a copper-nickel rich "Sudbury" [Ontario] impact crater, Mars may be a cheaper source than Earth [⇒ p. 2, col. 2]

The Mars Desert Research Station (MDRS) in Utah

The MMM editor spent two weeks in February at this remarkable facility in Utah. On pages 3-8 and elsewhere in this issue, he tells about the achievements, the frustrations, the opportunities. Most importantly, he lays out the case for other organizations to support the analog station effort in various ways. Much of what we discover in this effort will apply to Lunar operations as well.

Moon Miners' Manifesto

Moon Miners' MANIFESTO/ Moon Soc. Journal is published every month except in January and July.

• **Moon Miners' Manifesto CLASSICS :** Beginning with 'July 2004, we have begun an effort to re-edit, reformat, re-illustrate and republish the timeless articles of MMM's first ten years, with the intention of publishing two issues, each covering one year, in PDF format only, for free downloading, each January and July.

• **MMM's VISION:** "expanding the human economy through off-planet resources"; the early era of heavy reliance on Lunar materials; earliest use of Mars system and asteroidal resources; and the establishment of the permanent settlements necessary to support such an economy.

• **MMM's MISSION:** to encourage "spin-up" entrepreneurial development of the novel technologies needed and promote the economic-environmental rationale of space and lunar settlement.

• **MMM retains its editorial independence.** MMM serves several groups each with its own philosophy, agenda, and programs. Participation in this newsletter, while it suggests overall satisfaction with themes and treatment, requires no other litmus test. Any presumption that participating organizations can be labeled by indirect mutual association is unwarranted.

• For the current space news and near-term developments, read *Ad Astra*, the magazine of the **National Space Society**, in which we recommend and encourage membership.

• **The Lunar Reclamation Society** is an independently incorporated non-profit membership organization engaged in public outreach, freely associated with the National Space Society, insofar as LRS goals include those in NSS vision statement. LRS serves as NSS' Milwaukee chapter

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• **The National Space Society** is a grassroots pro-space membership organization, with 10,000 members and 40 chapters, dedicated to the creation of a spacefaring civilization.

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• **MMM's desktop publication** has received computer hardware and software support from the **Space Frontier Foundation**, 16 First Ave., Nyack NY 10960; 800-78-SPACE - SFF seeks to open the space frontier to human settlement as rapidly as possible.

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• **The Moon Society** is "dedicated to overcoming the business, financial, and technological challenges necessary to establish a permanent, self-sustaining human presence on the Moon." — See contact information on page 9.

• **NSS chapters** and **Other Societies** with a compatible focus are welcome to join the MMM family. For special chapter/group rates, write the Editor, or call (414)-342-0705.

• **Publication Deadline:** Final draft is prepared ASAP after the 20th of each month. Articles needing to be keyed in or edited are due on the **15th**, Sooner is better! - No compensation is paid.

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⇒ IN FOCUS Editorial continued from p. 1.

of such industrially strategic elements as copper, zinc, lead, gold, silver, and platinum.

The two frontiers may develop along differing industrial diversification pathways. That is only to be expected. As a result, both will inevitably produce some goods needed, but not produced locally, in the other, and purchasable at a definite cost savings over equivalent products produced down the throat of Earth's gravity well.

Having a developing frontier partner world will be an enormous bootstrap lift for each. The need of the Moon for Mars is so clear, that support of a Moon first strategy (in case the effort ends here) may serve in fact to derail efforts to open Mars, and thus hinder the Moon's viability. That is why, speaking only as an individual, and not on behalf of the Moon Society or of any other organization, I agree with Robert Zubrin's strategy. Rather than "do the Moon first - and, oh, by the way, testing equipment that could be adapted for use on Mars," we should go to the Moon with equipment designed for Mars in the first place. The danger in not doing so, is that the Moonbase initiative will become an end in itself, and no more lead to Mars than the Space Station has been designed as a depot to deep space. If we do not see (and design) each "rung" on the ladder to lead to the next, losing sight of the ladder, than we but paint ourselves in a corner, choose the infertile cul de sac path.

We are also so convinced, based on ample past precedent, that heavy NASA involvement will choke off and suffocate private enterprise initiatives on the Moon (intentionally or unintentionally does not matter) that we prefer to see NASA preoccupied with opening Mars, and using the Moon only as a test bed for Mars-bound technology.

The path to Lunar industrial settlement does not lie through a NASA lunar outpost, but through private enterprise development, possibly first for tourism and contracted support for agency-erected lunar observatories, then in support of Earth's insatiable energy needs.

The Moon alone is a viable tourist destination. The Moon can produce building materials for tourist and industrial facilities in low Earth orbit. Mars has little to sell the Earth directly, but quite a bit to support the lunar settlements and industries. The Moon is thus Mars' ticket to earn revenues to spend on imports from Earth.

But it is not enough to say we should open both frontiers at once, the Moon perhaps always one step ahead. We must also come around to see that we cannot open Mars effectively without tapping resources on Phobos and Deimos as well, and at the same time, *if not again, one step ahead.* The big rush to do Mars first, not only ahead of the Moon, but also ahead of its own moonlets, is an impatient plan that can only doom the effort in the long run. *"Visit the ruins on Mars!"8* the tourist posters will say one day. Why? Let's do it right. We need to develop a whole intertrading system. Moon-Phobos-Deimos-Mars, *and perhaps more!* **PK**

A Broad–Based Effort to Expand the Scope of the Analog Research Station Program

by Peter Kokh, Editor of Moon Miners' Manifesto
Life Member, the National Space Society
President, the Moon Society, Member, the Mars Society,
and MDRS Crew #34, The Junk Yard Wars Refit Crew

Both the Mars Arctic and Mars Desert Research Stations (FMARS and MDRS, respectively) established by the Mars Society, have been working magnificently from the beginning to create environments from which we could learn better field exploration techniques. We *have* been learning what techniques and what equipment, that look good on paper, work in the field, and what does not.

By the simple means of having all crew members wear "space suits" whenever they go outside the Hab, the illusion that they are on Mars thus created is strong enough to induce the crew members' wholehearted participation in the experiments they conduct. Good choice of host terrain with minimal plant life, suggestive in coloration and land forms of what we expect to find on Mars certainly helps. The lack of phone and cell phone service as well as of TV all reinforce the illusion. Understandably, there is no effort to impose 6-40 minute time delays on Internet downloads and uploads (although that would be the case on Mars!) but a token 3 minute delay is worked into communications between the Hab and Mission Support in Denver or Ann Arbor.

We have learned that ATVs, "unpressurized rovers" not unlike the Apollo Moon Rovers used on A15, 16, and 17 are essential: rather than be replaced by larger, faster, longer ranging vehicles with pressurized cabins, they are necessary to accompany the later, much as in a naval fleet, a lot of specialized smaller craft accompany the battleship. Taking it a step further, we have learned that small teleoperated robotic rovers operating on tether leashes from the ATVs or PEVs are enormously helpful. They can scamper up hills and down valleys unnegotiable by the wheeled ATVs and PEVs to greatly enhance the exploration and examination of terrain traversed.

We have learned what instruments are helpful in exploration: GPS units, and software that tells the explorer what route from A to Z will get him to Z in the least time with the least exertion and the least risk. That is something that is not easily determined by visual clues from point A alone. We've experimented with different types of tools to do geological field work as well as biological tools to look for evidence of microbial life.

While much was learned about space suit design and performance in the Apollo experience, we've learned a few more things on Devon Island and in SC Utah. The ingeniously designed mock-up EVA suits have brought to light a number of design challenges that must be addressed if our pioneers are to function as efficiently as possible.

We have discovered a few things about the human life support system as well, for example that we only need a third as much water ration per person per day for hygiene maintenance as NASA paper studies had supposed.

We have learned how to better organize daily work schedules, how best to divide the workload, how best to combine work with attention to personal needs and inter personal relations.

In short, the Analog Mars program has helped uncover lessons that never would have been learned on paper. We are helping to contribute to the success of future efforts by NASA and other space agencies.

These efforts have also attracted much publicity, resulting in increased anticipation and support on the part of the public and the media. The Mars Society's strategy has been two-pronged from the outset.

How can we do more, and on a broader front? At this point, we need to take a look at some serious questions:

Question: What can we do at MDRS to learn more - without tearing down the present hab and building a new one?

Question: What useful simulations can be done in settings that are not "Analog Mars," but which are more easily supported logistically?

Question: What useful work can be done at MDRS - and elsewhere - by other groups who share the goal of preparing the way for humans to establish permanent presence on Mars and other worlds beyond Earth? The past two decades have been ones marked by turf-protectionism, dare we say "turf-rententiveness," on the part of separate space enthusiast organizations and their leaders. Looking forward to a 21st Century marked more by collaboration, what can we all pitch in to help achieve in the area of outpost and outpost activity simulations?

Lessons from a working visit to MDRS

Last August, we announced a new Moon Society project to "rent" MDRS for a two week period in order to conduct a number of Lunar Outpost activity simulations. At first glance, there seems to be a good number of useful things we could do in south central Utah, some relevant to lunar outposts only, others relevant to outposts on both Moon and Mars. But without first hand knowledge of the facility, it would be difficult to plan an effective "Moon Mission." It was important to go see for myself. Having long been a Mars Society member as well, I applied as a "crew volunteer," and with the help of long time friend Ben Huset of the Minnesota chapter, we both secured a spot on Crew #34. This was especially fortunate, as this crew would not be a simulations and research crew, but a "refit" crew: our mission was to replace the Hab's wiring, plumbing, and heating systems -- bring them up to code and solving some major problems: repeated pipe freezing, uneven heating, etc. Crew #34 was an opportunity to learn how MDRS worked from the inside-out as assistant electrician and carpenter.

Necessarily designed as inexpensively as possible,

and assembled as quick as possible to meet season use and publicity timelines, MDRS suffers as a result in some areas:

• **We cannot simulate a closed life cycle environment at MDRS**, even with a much more thorough biospherics module than the present GreenHab which recycles gray water from sinks and showers for use in flushing the toilet -- MDRS leaks like a sieve. It is not a sealed structure, and it would be cheaper to build a new one than to seal it effectively.

Air recycling and thermal management are not the only two casualties of the leaky hab. Dust control is all but impossible. Mouse control is a lost cause with a two inch gap under both front and rear hatch doors, besides oversize holes for pipes and conduits passing through the hab wall, and poorly sealed, uncaulked portholes, and a loose laying plexiglass door over the roof emergency exit hatch that flaps in the wind.

• **We cannot easily conduct Adequate Shielding Exercises** - First, the site is owned by BLM, the U.S. Bureau of Land Management, and our conditions of use require us to tread lightly on the site. Moving around large volumes of soil might not fly. Even should we get a "variance," shielding the Hab would be a daunting proposition. It is too tall. Sandbagging the Hab dome alone would be insufficient and futile. A spread out, one story "Mars Ranch" structure, set on or into the local surface, would be much more practical to shield.

And this situation is regrettable. While in Utah, we are not subject to the same cosmic radiation and solar flare threats from which Mars' explorers and pioneers must seek shelter, our "Field Season" is unnecessarily shortened by the impracticalness of cooling the MDRS Hab from the fierce summer desert heat.

On the Moon and Mars as well as in Utah, the principal co-benefit of shielding is thermal equilibrium. Face it, Mars' surface is as cold, or colder than Antarctica. Yet a few meters down, the soil temperature is the same year around, though the equilibrium temperature there is much lower than it is on Earth or on the Moon. Thermal equilibrium is the principal design benefit of underground housing on Earth. Soil-sheltered habitats simply make sense, however uninteresting they may look to the photographer or artist. And we do need to simulate this, to uncover design challenges that are surely lurking. For in fact, while we do have considerable experience from building earth-sheltered homes here on Earth, they are not designed to the same set of constraints we will face on the dry Moon or on wet Mars.

The Hab *has been designed for expansion.*

The Mars Desert Research Station Hab structure was designed with two EVA hatches. The rear one has been used principally for quick access to the generator and diesel fuel station, to the propane tank, and to the water tank. But from the outset, this extra exit was looked on as a point of future expansion. Now the time may have come to take a new look at this option -- for on Crew #34, all these utilities have been relocated to a new area, shielded from the Hab by a thirty foot hill. That barrier provides quiet (the generator is a major noise contributor, day and night) and safety: should any of the fuel sources ever catch fire or explode, all of them would in a chain reaction -- the hill provides safety from the fireball that would result. Note: Crews 33 and 34 also installed a superior grounding system, a real feat in the low-conductivity soil, following the ideas and methods, .and using the tools developed by a young volunteer from Caracas, Venezuela, Gregorio Drayer, under his supervision.)

Expansion modules, hard-shelled or inflatable, if designed in one-floor or "ranch" fashion, might support emplacement of *removable (sandbagged)* soil shielding. This would provide a test of the thermal-equilibrium benefits and a basis for redesigning future analog Habs.

The Hab now supports some activities that get in the way of one another. While it is important to design multi-function space that will see more round-the-clock use, it is equally important that these multi functions not interfere with one another. My choice for first candidate to move to new added expansion space is the workshop-tool-shop-fabrication area which could include an area in which to experiment with making things out of the local soil (even if it is chemically or mineralogically a poor analog of soils on Mars.) These activities are currently hosted by the Lab Science area.

A real Greenhouse engaged in food production as well as gray *and black water* recycling should be next. The principal impediment to growing food at MDRS is that the site is occupied only seasonally, primarily because of the desert summer heat, which could be managed by living undersoil. But that facility still could not recycle the air of the leaky Hab (one reason winter season heating bills are so high.) It must be added, however, that even if we overcame the heat problem in this fashion, the volunteer supply is not great enough currently to handle year around operations, unless skeletal crews are used in the summer season..

What else needs to be simulated?

• **Simulating Human Crew Systems:** No matter how good our equipment is, no matter how well we have developed our procedures and processes, the most important system of all, because it is central to everything else, has been simulated only on a hit and miss basis, with the result that lessons learned, while valuable, are trivial in contrast to the need. We must not downplay simulation of human crew systems.

• **Simulating the Mars Frontier Diet:** There has, in fact, been a hit and miss effort to simulate the kind of diet Mars Pioneers will surely face: freeze dried foodstuffs from Earth rehydrated with water from Mars, supplemented *occasionally* by fresh produce from the garden, and possibly by not too frequent treats of Talapia filets: Talapia are a species of fish which thrive reasonably well in gray water systems integrated with greenhouse food production. The

problem at MDRS is that individual crew members vary greatly in their willingness to go *that far* in simulating the Mars experience. All too frequently, their shopping trips in Salt Lake City where they gather to begin their mission, end up with a lot of menu-buster treats. The pioneers on Mars will have no such luxury.

• **Simulating Frontier Recreation, Art, and Hobby Options:** In after supper free time, if there is any, crew members at MDRS can read, play games, watch DVDs. In fact most are busy at their laptops. Simulating realistic frontier recreation and hobbies is something that can happen at MDRS but seems to have been given no real emphasis. We contributed a Mars analog version of the age old African classic game known by various names from tribe to tribe, and most commonly in the west as Mancala or Oware. The board was crafted from wood, but painted to simulate Martian ceramics. A "pit and pebble" class game (rated as one of the nine best of all time in strategy), our version has been dubbed **Craters & Blueberries.** We also took a look at Scrap and Trash generated at MDRS. On the future frontiers, such humble materials will jump start frontier arts and crafts. See our report on page 8.

• **Simulating Ergonomic Alternatives:** Ergonomics is important for good crew morale and efficient operations. A major opportunity was missed by the decision, in designing MDRS' interior, to copy the layout of the FMARS arctic facility. A clean slate redesign, finding new solutions to the same design constraints, would have yielded useful ergonomic information, comparing experiences at the two stations. The interior of the Euro-MARS station slated for Iceland, has indeed been redesigned from scratch, and whether it has the blessing of the Society's founder or not is immaterial.

You can not learn if you don't vary the conditions of the experiment. It is that simple.

Happily, the Aussies are proposing a Hab that is not of the double tuna-can stack variety, but going back to an earlier design for a more horizontal, easier to shield structure.

• **Hab Interior Ergonomics:** Getting back to my recent visit, I had hoped to get input from my fellow crew members on what they would change about MDRS, if they had a magic wand: what areas could function better by mutual isolation, which by being collocated more closely. What functions of common areas would be better served by having a dedicated space to themselves? What activities, not supported by the current design should be worked into any proposed expansion. Alas, we seldom had free time after dinner. We were always behind in our refit schedule and worked often into the wee hours before hitting the sack. I was able to get only minimal feedback.

We hope to develop a questionnaire that future crew mission commanders can circulate on a voluntary basis, and thus get a wide spectrum of input. And by also circulating feedback forms to past crew members, we may get some return. Unfortunately, such debriefing will suffer from the staleness of memories. But it is also possible that some former crew members will have better digested their experiences and be able to pick out and identify things that bothered or irritated them that they might not have been able to "put their finger on" in a classical "fresh from experience" debriefing. Both fresh and digested experiences are helpful.

At MDRS, the interior of the Hab is very poorly simulated, along with living conditions. In the recent "refit" mission, we had no time to attend to even a partial facelift. There are materials other than wood and drywall that would simulate likely interiors at not too much extra expense. Right now, that is not a priority, though the money could be easily raised separately.

• **Acoustics:** The individual staterooms share the same floor as the wardroom common space: without any acoustic insulation, this is a problem for those early to bed and early to rise. Ear plugs are one way to cope. But this is a problem that could have been lessened with good design and involvment of an acoustics specialist. In fact, the Hab is a very noisy environment, and that can only dampen performance over the long haul. Relocation of the generator behind Engineering Hill has removed offender # one, however.

• **Logistics is important.** For MDRS, Salt Lake City, the nearest major air hub some 240 road miles to the north, serves as the staging point. (Denver and Las Vegas are both 400 miles distant. Grand Junction, CO at 160 miles is only a regional airport with higher air fares.) From Hanksville, the nearest hardware stores are 115, 160, 188 miles distant. Now remoteness from urban areas does have its advantages. It helps set the scene psychologically. And the MDRS clear moonless nights offer an awesomely star-spangled, Milky Way dominated gasp of what it must be like to be suspended in space, or on Mars or the farside of the Moon.

• **Dust Control:** A determined effort to identify all the holes and gaps in the Hab outer wall and bottom floor should be made, and a master plan developed to seal them with durable materials that blend in. A stop can be built into the hatch thresholds that will do away with the 2 inch gap along the floor that remains when the hatch is closed. And above all, let's put out the call for a donor to cover the need of fabricating new porches and steps and apron approaches to the steps out of grating. When it rains even a little, the plant-free surface turns to mud, and with only wood and plywood surfaces guarding the entryways, transport of mud inside is guaranteed. That the Society does not have enough money in its general funds is no excuse. If it's worth doing, and it is, we must ask for dedicated funds, special donations. People give more when they know it is going to something specific the importance of which they can appreciate. The porches and steps are a prime example of a false economy,

Maintaining "Sims" (doing all outside activity in EVA spacesuits; staying on Analog Mars): Remoteness of hardware supplies from lumber to electrical, plumbing, and water supply needs was a major challenge for our "refit" mission. But simulation and research missions are designed to be more self-sufficient. However, the crew members on hand may be minimally capable of meeting various equipment and other emergencies and reliance on intervention from nearby Hanksville is openly accepted.

We are making no progress towards simulating Real Mars Frontier Isolation from Earth.

MDRS is dependent on regular fuel supplies from outside: diesel fuel for the generator; propane for heating and cooking; and water. In short, we have not yet been able to upgrade MDRS to the point where we are generating our own fuels, Marslike, from the atmosphere, or tapping local water reserves underground. We use only some solar energy, for the GreenHab. We also depend on outside services to repair the ATVs, an all too frequent need. On Mars, the outpost will have to be equipped for such emergencies, and have trained personnel among the crew consist.

That we pretend that Hanksville is a Mars Orbiting Station, and that Salt Lake City is Mars' moon Phobos, does little to simulate real Mars emergencies and real lack of options. There has been some hit and miss effort to document "out of Sims" activities. To minimize these occurrences will take a many vectored approach. And in preparation for developing such portfolio of strategies we will need more consistent, more detailed documentation, both on the part of the Crew Commanders and on the part of our offsite support people.

These many improvements can only be phased in, one at a time. The important thing is to realize that we must make progress in that direction,

Place for a lower level of "Sims"

Not everything has to be harder. On Mars itself, if all the things that needed frequent and regular attention and access where placed under a shielded, but unpressurized canopy or ramada, those attending to this area could wear lighter weight, more user-friendly pressure suits. At MDRS, those attending to the generator or other outside utility sources are supposed to wear full EVA suits. One of the personal projects I chose for my time at MDRS was to investigate the practicality of a demonstration of this system in Utah. Now that all the utilities have been relocated behind a noise-, fire-, and blast-buffering hill, we at MDRS could assume that they are under such a canopy, and wear designated lighter overalls and a special gas mask to simulate the lighter suit. A study of the ergonomic benefits recorded would give feedback on the value of such an innovation. Walk areas thus protected could be marked with simple color-coded poles, for fabric pretend canopies would not last long in our Earth desert winds.

What can be done elsewhere to compliment the learning exercises at MDRS and FMARS?

The Moon Society looks forward to the day when it can establish its own analog research station in terrestrial locations more suggestive of the Moon's surface than that of Mars. But that is not our concern here. What can de done elsewhere, *in any type of host terrain* (even verdant farmscapes and urban cityscapes) that will help us prepare for pioneering Mars (and the Moon)? While exploring the surfaces of other worlds, and examining their chemical and mineralogical makeup may be the most obvious, visible, and high profile aspect of early outpost activity, it is only the above-horizon tip of a largely hidden iceberg. Far more basic will be the successful operation of the systems that sustain the pioneers: life support, inclu-ding food production and recycling of water, air, and both human and agricultural biomass waste. And the systems that maintain both the physiological and psychological health of the pioneer *teams*. None of this depends essentially on the host terrain, at least not in ways that require some sort of visible match.

Life support, medical systems, human factors such as ergonomics, food menus, etc. -- all these can be simulated anywhere it is convenient to do so. Logistics: where do the principal investigators live? or where is it convenient for them to visit habitually Where are clusters of volunteers?

These questions are important. In Utah, only one person maintains real continuing presence to help ensure some degree of continuity between crews. Don FoutZ, a local resident of Hanksville and a strong supporter of the Mars Society's analog hab program is on call, ready to train incoming crews, trouble shoot problems with the balky generators, and fickle Internet uplinks, and so on. We are fortunate to have Don. Without him, the Hanksville-based facility would have collapsed after the first season, if indeed it lasted that long. Of extreme importance are both continuity in expertise and availability of critical personal who take ownership of ongoing programs that cannot be adequately managed from Mission Support in Denver.

It would be difficult to run a more ambitious Greenhouse Food Production and Water Recycling system without a principal investigator living nearby. That such a facility serves a crew of six persons engaged in exploring an analog Mars landscape is irrelevant. Whether this be a program managed by staff at some university or college or by a dedicated individual, continuity and dedication both demand that the site be convenient, on a weekly or more frequent basis by the person accepting responsibility, and responsible for the design elements, and with authority to make changes. For "load," such a system could be linked to any living space regularly occupied by the desired number of persons, six or whatever. There is no need for the persons imposing the load (food needs, waste generation) to be involved with Mars simulation activities of any kind, unless some such can be happily collocated.

A medical system designed to meet all reasonably expectable emergencies for a group of six (or whatever) adults could be tested in any isolated small community where access to medical services is extremely limited. Small Eskimo or Innuit villages might do, although most are *too easily accessible,* these days, by airplane or helicopter.

MDRS is both blessed and handicapped by its remoteness. But Mars will be significantly more remote. All the more reason to go beyond field exploration techniques to pre-develop all the systems that will be needed to survive on Mars long term, *without recourse to rescue or resupply*.

At sites near stable clusters of dedicated individuals, simulations can be run by long term crews Other groups, inside and outside the Mars Society, can conduct exercises elsewhere that complement work at MDRS:

- thermal management through soil (regolith) shielding
- identify and develop optimum models of outpost expansion and develop expansion architectures
- develop more tightly closed life support systems that recycle air, water and waste to provide fresh food
- develop realistic food-nutrition-menu systems that expand phase by phase in diversity and satisfaction
- experiment with different interior layouts to determine their ergonomic pluses and minuses
- develop crew recreation, arts & crafts, gaming, and hobby opportunities for greater crew morale

Fringe Benefits of Multiple Networked Simulation Sites

Distributing the simulation workload will allow the tapping of personnel and organizational resources not now accessible to the Mars Society's Analog Mars Program. That benefit is considerable: more talent, more money, more publicity. This united effort will not be lost on the public nor on Congress which will soon pick up on the signal that "those feuding space groups" finally have their act together.

Geographic dispersal of the effort will also model the development of a multi-site, multi-settlement Mars Frontier Economy. That too will help science popularizers sketch out just how a first human mission will evolve beyond flags and footprints into a second human home world.

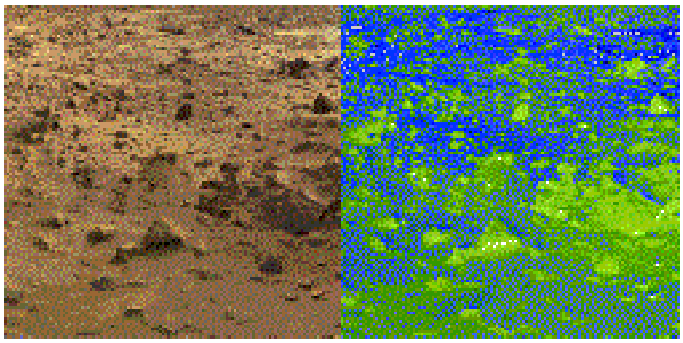
There are already strong dedicated concentrations of volunteers in the form of focused chapters within the Mars Society, the National Space Society, and the Moon Society that could undertake some useful bite-size project, however humble, in support of the broader effort. SEDS (Students for the Exploration & Development of Space), and other groups might be willing to help. We have grounds enough to launch an Analog Mars "Extension" Program.

Benefits from many simulation exercises will apply with minor adaptations to both Moon and Mars. Others will apply only to one or the other. We call on other Space Organizations to endorse an expanded Analog Simulations Program and seek appropriate ways to contribute to it. This will grow chapters as well as public support. **<PK/MMM>**.

Testing Colors for Survival on Mars

by Peter Kokh, MDRS Crew #34

Representing the Wisconsin Mars Society Chapter, I devised a simple experiment to test which colors are most easily picked out against a Mars-hued background. I had my suspicions that lighter shades of green and blue would stand out most prominently. Why? If you take a color photo of a Marsscape and invert it in your paint program, that is what you get: light greens and blues: the opposite of Mars hues: "Mars' Missing Colors." PDF file readers can see this below.



Hardcopy readers can check the following page:
http://members.aol.com/tanstaaflz/petesmars_projects.htm

First, I picked up one each of every color paper sheet my nearest Kinkos had in stock, some 19 different shades including many pastels and all the astrobrights™. Next I bought a 24-pack of transparent plastic drinking cups from Walmart. The purpose here was to find something stackable and compact for air travel. I cut the bottom off of one cup, cut down one side, rolled it out and made a template. Once on location, I used the template to cut out shapes from the color sheets. These I applied to the sides of intact cups, securing the paper with tape. I took my stacked color cups outdoors, found a pile of handy pebbles and put enough in the bottom of each cup to keep the cups from being tossed here and there by the wind. Then I looked for nearby hillocks and set the cups out randomly here and there in two different locations.

Later, results chart in hand, I stood at various distances from the cups, up to 200 yards. The round shape meant that sun angle did not matter much. I did return to check again at various times during the day, again at dusk.

I was quite surprised by the results!

- any colors outside the background color range are visible, but especially lighter and brighter ones.
- What really helps is that the cups are areas of solid consistent color and regular shape: both features stand out from random pattern and variegated coloration
- Yellows, blue-greens, pinks & fuscias (red is too dark), mid to lighter blues all arrested my sweeping gaze.
- In deep dusk, darker colors, even those well out of Mars shades, are hard to see. Light, bright, astro colors best.

Vehicles, spacesuits, road signs of regular shape and solid colors will be easy to see on Mars. **<PK/WMS>**

MDRS Scrap & Trash vs. Spirit & Opportunity

Report by Peter Kokh, Wisconsin Mars Society
MDRS Crew #34, the Junk Yard Wars Refit Crew

Scrap & Trash at MDRS

One of the items on my list of things to do at the Mars Desert Research Station was to take a look at any scrap piles that may be on the premises and also at what was in the everyday trash. I found the area known as Antarctica or the Engineering Area just south of the Hab, hidden behind a pair of natural mounds both from the Hab and its access road. There I found discarded PVC pipe and fittings (from the old GreenHab), some copper, aluminum and steel; also some wood, old 5 gallon paint drums, and discarded (probably non-functioning) equipment.

Daily life in the hab itself produces a significant volume of items that would normally be recycled. Alas, Hanksville is quite small, and rather isolated; there is no place that accepts recycling within a hundred miles. So there really is no practical way to recycle paper, plastic bottles, or aluminum cans, unless one hauls them back to Denver or Salt Lake City. These items are not sorted, but just discarded with other household trash. Plastics #1 and #2, glass bottles, and aluminum cans are regularly available as well as the PVC and other items stored in the scrap area because they are too large or bulky to fit in trash bags.

With the right "spirit," all of this scrap and trash becomes "opportunity." How so?

On the frontier, art and craft will play a major role in making us feel at home. But the sort of preferred art and craft materials with which those with artistic and craftsman talent are used to working will be in short supply, exorbitantly expensive to import from Earth. But even on Earth, many an artist and craftsman cannot afford the preferred materials. When you have more talent than money, anything free that is workable will do. All you need is the appropriate tools for the chosen materials, and inspiration.

All of the materials mentioned above have been used by others to create art and artifacts. For inspiration, simply do a Google search; you will find websites with content to get your imagination started on aluminum can art, PVC art, plastic bag art, and more. You will find more help at your local library or arts and crafts store.

Now you might think that this kind of "crude" art is good mainly to teach children creative self-expression or to give bored old folks something to do. But it is really a matter of talent and creativity. People who have it have turned out some beautiful creations out of trash. There have been prestige exhibits that feature creations from recycled items exclusively.

Art & Craft at Mars Desert Research Station

What's any of this got to do with the Mars Desert Research Station? In the evening after the work of the day is done, we write our reports and the balance of the time before we turn in for the night is ours to use as we each please. We can watch movies, play games, get lost on the Internet, or -- work on some project. There is no reason why art and craft cannot or should not be engaged in.

Not every volunteer will feel the urge to express themselves in some physical medium. While there is great effort taken to balance the talents of crew members, and almost every crew will have some creative people, that doesn't mean that there will be a painter, sculptor or other kind of craftsperson.

But if you are the type, and are chosen for a crew, you should know that these possibilities exist. Of course, nothing in the rules or guidelines prohibits crew members from bringing along art and craft materials of their choice with which to pass free time hours.

Wisconsin Mars Society intends to assemble and ship a kit of tools and books for future crew members to use to try their hands at creating things from commonly available scrap and trash items at MDRS.

Art & craft produced at the Mars Desert Station can be brought home as souvenirs or sold at auction at a Mars Society Convention to help raise funds for the analog program. But it can also be used to decorate the common and private areas of the Hab itself. And that would indeed be simulating what will happen on the frontier. These options seem exciting to me, and I just thought I'd like to share that with you. **<PK/WMS>**

The Moon Society

J O U R N A L

http://www.moonsociety.org

Please make NEWS submissions to KokhMMM@aol.com

The Moon Society was formed in July, 2000 as a broad-based membership organization with local chapters, to spearhead a drive for further exploration and utilization of the Moon in cooperation with other like-focused organizations and groups.

Artemis Society International was formed in August 1994 as a forum for supporters and participants in the **Artemis Project™** quest to establish a commercial Moon base as a first step to a permanent, self-supporting lunar community. **ASI** does not engage in any form of commercial business directly, but seeks to build a Project support business team. Registered trademarks of the **Artemis Project™** belong to **The Lunar Resources Company®**

PROJECTS: www.moonsociety.org/projects/

The Artemis Project™ – Project LETO™ – Rent–MDRS

Moon Society DUES include **Moon Miners'Manifesto**

- **Electronic** (pdf) **MMM $35** **Students/Seniors**: **$20**
- **Hardcopy MMM**: U.S. & Canada **$35** Elsewhere: **$60**

Join/Renew Online – www.moonsociety.org/register/

Mail Box Destinations:

- **Checks, money orders, membership questions**
  Moon Society Membership Services:
  PO Box 940825, Plano, TX 75094-0825, USA **:**
- **Projects, chapters, volunteers, information, etc.**
  Moon Society Program Services
  PO Box 080395, Milwaukee, WI 53208, USA

OUR LOGO above, shows the Moon in its natural beauty, empty and deceptively barren, waiting for human settlers to shelter and to mother as an adopted new human home world. We have work to do!

Society Board elects Two New Directors

By Peter Kokh, Moon Society President

February 16, 2005 -- Moon Society Board of Directors elections are held annually on a staggered basis. Seven members serve two year terms, four elected in even number years, three in odd number years. But suddenly we found our selves with two empty spots. Newly elected director Steve Jackson resigned for personal reasons. Then Michael Mealing found himself forced by job comm itments to resign as well, not only as a director, but also as President of the Artemis Society. We thank them both for their service.

In the case of mid-term vacancies, Society bylaws call for the Board to elect replacements. Elected are **Charles F. Radley** #868 of Tigard (Portland), Oregon and **Bill W. Clawson** #897 of Fremont, California. Both new directors will serve the remaining sixteen months of terms ending in 2006.

Introducing Five New Members of the Society's Board of Advisors

We introduced the first fifteen members of the Moon Society's new Board of Advisors in the December issue #181, page 11. We have now added five more, bringing the total to twenty. We are proud to introduce them to you:

- **Alan B. Binder**, Lunar Research Institute, Tucson, AZ. Principal Investigator of the **Lunar Prospector** mission that in 1998 discovered high ratios of hydrogen in permanently shaded areas of the Moon's polar regions, presumably representing cometary water-ice mixed in the top regolith area.. He took over the grass-roots launched project in 1989 and held it together until NASA adopted it as its second Discovery Mission.
- **Eric Douglass**, Mechanicsville, VA. American Lunar Society webmaster and its newly elected President. Created and opperates the ALS Lunar Observers Certificate Program with Lunar Geology Primer.
- **Peter Eckart**, Munich, Germany. Space engineer, and author of the highly praised "Lunar Base Handbook."
- **Geoffrey A. Landis**, NASA Glenn Research Center, Cleveland, OH. Well known scientist and author with an encyclopedic grasp of the technical issues of space exploration, author of many breakthrough concepts.
- **T.D. Lin**, Wilmette, IL. Principal Research Engineer. Construction Technologies Lab., Div. of Portland Cement Assoc., Skokie, IL. In the early 1980s, demonstrated the production of concrete cement, first from Lunar Simulant and then from actual Apollo return samples. He has since refined his techniques using a water-conserving steam process. Designed a 210,000 square foot lunar outpost made of concrete and steel. He has spoken at several ISDCs and other conferences.

Our Own Lunar Analog Research Station? What we might want to do *differently*

by Peter Kokh

Even before my recent two-week stint at the Mars Desert Research Station in Utah, I started keeping a file of ideas under the heading "what we might want to do differently at our own Lunar Analog Station." Grant you, that is not a near term project. But planning ahead is good.

Location: there are two schools of thought here:

a. Put it in the heart of a high traffic tourist area such as Las Vegas or Orlando or even Chicago.
b. Set it in a location where the terrain is suggestive of moonscapes: on a lava flow sheet, with access to lava tubes, perhaps

I do not believe you can satisfy both objectives without serious compromise. Further, tourist traffic and serious research without tourist interference do not go hand in hand. We do need both, however. The answer is to build two stations (two identical stations are cheaper than twice just one.) We have one in a high traffic area for tourists and public education, the other in an isolated location where we can do serious work. Web cams at the research station will feed monitors at the tourist facility.

Logistics: While isolation is great, logistics can be a continuing problem. The closest major airport to MDRS is 240 miles away in Salt Lake City. Travel is over good roads, but only a quarter of it is by Interstate. The nearest hardware store is 115 miles away. The nearest home center 165 miles. Can we do better? Not sure. One site I looked at , the Black Rock Desert lava flow area in Utah is 150 miles S of Salt Lake City, almost all of it on I-15, but the terrain proved unsuitable. Craters of the Moon National Park and surrounding Bureau of Land Management area in Idaho are just as far from Salt Lake as MDRS, and only a little closer to Boise, only a regional airport. Bend, Oregon doesn't fare that much better. We have plenty of time to search.

Habitat Design – Profile: I understand the origin of the Mars Hab shape, but it is a mistake. The Mars Society has backed itself into a corner on this one. The two floor Hab would be a bear to shield (if the Mars Society wanted to do so.) I recommend we look for some sort of Lunar Ranch design. Shielding is essential on the Moon, both for radiation protection and for thermal equilibrium. By looking the other way on this, the Mars Society people have got themselves stuck with an unnecessarily short field season: a shielded Hab could "coolly" function throughout the summer.

The Artemis Moonbase triple SpaceHab is one floor but way to small to serve as a functional outpost, even as a starter outpost. Two or three of them, linked? Perhaps. Let's not be bound to the venerable SpaceHab design. We could either start from scratch, or sticking with the Artemis module for a starter core, add additional modules of the same or new designs, perhaps even an inflatable (so long as the height to width-length ratio is kept low.)

Hab Design – Function Space: The Mars Hab's two floors with a combined floor area over a thousand square feet or 110 m2 is already much bigger (c.4x) than the Artemis Moonbase core module. But it does not serve all functions adequately. MDRS is in dire need of expansion. (See my report this issue, pp. 3-7) We need a separate tool and fabrication shop, and perhaps dedicated hobby and "puttzing space." An isometrics exercise room would be great.

Acoustics at MDRS are very poor, more so because it was given no attention in design and construction. Dust control is also a severe problem. Our facility needs to be much closer to air-tight, relying on air-exchanges and plants to keep the air fresh, not loose joints and holes. Proper design of entrances (airlock-hatches) and their porches, steps, and aprons will help.

Hab Design – Utilities: It would be ideal to mimic the situation on the Moon as far as practical. Heavy use of photovoltaics (solar power) to run all the lighting (12 volt) and at least all the lower load outlets. Where we need appliances and equipment for which 12 volt versions are not available (yet) we will have to do with 117v AC power. MDRS uses diesel-fueled generators. Is there is a more appropriate option for us? We should look for one. Fuel Cells? Again, solar power is the optimum, and that means picking a site with a high percentage of sunny days. No propane stoves!

Hab Design – Interiors: The first Moonbase will be manufactured on Earth. But we have time to incorporate into our research station features that mimic what pioneers can produce on the Moon. No wood 2x4s or Drywall (sheetrock) when for little more we could buy steel 2x4s and Duroc (cement) panels on interior walls, and something like glassboard on exterior surfaces. If we are going to set the mood for simulating outpost life on the Moon, we owe it to ourselves to do it right *inside and out.*

Life Support: We cannot expect to be able to provide *total* life support on any reasonable budget. But we should work aggressively to go beyond the gray water (sinks, showers) treatment demonstrated at MDRS towards at least partial black water (toilet wastes) treatment combined with food production. The Wolverton system is a place to start. This ambitious goal implies year-around occupation or tending.

Medial Systems: MDRS has an excellent first aid kit and daily email contact with a doctor. Can we do better? It is worth discussing. In reality, many medical emergencies will have to be treated on location. On the Moon, transport to Earth is only an option for postponable procedures.

Crew Life Styles: We need prior commitment from our volunteers to participate wholeheartedly in experimental pioneer vegetarian food preparation and menu development. It's a matter of getting into the spirit and will generate good publicity. But we should also incorporate time, space, supplies and tools to allow experimentation with pioneer-appropriate arts and crafts.

Facility supported research: Geology and microbiology are big items at MDRS, and that is quite appropriate for Mars. On the Moon, there is no question of life: those into biology are better occupied developing our biospheric life support systems. And we have already done considerable geological investigation on the Moon. More remains to do. The point, however, is that unlike a Mars base, where exploration is goal one, on the Moon, developing ways to tap local resources and start making stuff is at the top of the list. From that point of view, the visible appearance of the host terrain is less important than its geochemical makeup. Basaltic areas that do not necessarily remind one of the Moon will still do fine. If we can have both, better!

We need to prioritize the things we want to demonstrate: shielding emplacement; regolith handling; oxygen production; cast basalt technologies; ceramics; glass composites perhaps. There is a lot of things we can do.

Talented volunteers or ....? The Mars Society has done a splendid job of attracting talented students with masters and PhD thesis projects worth demonstrating at MDRS, projects in the fields of geology, biology, and astronomy. While we can attempt to do the same, changing the stress, however (especially in biology), what we want to do in the area of demonstrations suggests that we prime the pump by organizing engineering competitions on the college level: competitions for automated or teleoperated shielding emplacement systems, for example, with the winning team getting to do the final demonstration at our location. Such an effort would build enthusiasm and provides plenty of publicity at every step. It also builds local cores of support.

Summing up: I have been a very strong, ardent and outspoken supporter of the Mars Society's analog station program from the day it was first announced. They have done wonders on a small budget with volunteer resources. Their program deserves respect. Even after two weeks spent at MDRS in Utah, and seeing all the room for improvement, I am still a strong supporter. It will not be easy for the Moon Society to improve on what they have done. However, we have the benefit of time on our hands. We can afford a more deliberate, patiently methodical approach. Our needs differ in part. We can do it, given time, but only if we don't wait until we have the money to start brainstorming and planning. Let's start now. **<PK>**

How and Why we should participate in the Mars Society's Analog Station Program, *both for our own purposes and for purposes we hold in common.*

By Peter Kokh. Interim Project Manager

This is a topic I wouldn't be writing about had not Mars Society President Robert Zubrin announced at last years Convention in Chicago, that he was willing to discuss MDRS rentals for two week periods by other groups with compatible goals. MDRS is not ideal for Lunar Outpost Simulation Exercises, but it beats the heck out of what comes in second -- there is nowhere else comparable.

Let's put on our gray-tone glasses and take advantage of a windfall opportunity. MDRS cost the Mars Society well over a hundred thousand dollars, just to build the Hab shell. Erecting it, outfitting the interior, installing all the utilities, preparing the site - that cost much more. It's ours to rent for the nominal sum of $7,000 for a two week period. Add to that a food budget, transport costs from whatever staging points we use (Salt Lake City by air,k Green River, UT by bus or train), and the purchase, rental, or development costs of any special equipment we want to bring. Crew volunteers pay their way to SLC or Green River.

In our "Initial Project Feasibility Findings: A "Go" for MDRS Moon Mission #1" November 20, 2004, we outlined quite a number of useful exercises in which we might engage with the expectation of learning something. After two weeks spent on location this February, with a few additions and subtractions, that prognosis remains valid.

It makes sense to collaborate with the Mars Society in this way *because* many aspects of frontier life will be the same on both worlds; *because,* also, Mars and the Moon are natural trading partners, each enhancing the viability of the other. It also makes sense *because* it will better prepare us to locate, design, and outfit our own Lunar Analog Research Station so that it bests serves our needs, when that day comes. It makes sense too, *because* such a rental will give us badly needed media exposure, more respect among our peer associations, and make us more attractive to prospective members. It makes sense, from many points of view, *because* it will use our talents and energies efficiently to do what we can as a society to advance the day when humans will live and work on the Moon into the indefinite future..

Our Moon Mission Crew will go the extra mile in simulating lunar life inside the hab as well as outside. We may make lasting contributions to the MDRS operation. We will join the growing fraternity of MDRS alumni. Turf-retentiveness has gotten none of us anywhere. The time for collaboration is now. It's in our own best interest. **<PK>**

Utah's Black Rock Desert: A Lunar Analog Site? We Paid a Visit

Report by Peter Kokh

In preparing for my February trip to the Mars Desert Research Station, I spent some time familiarizing myself with Utah. In the process of doing so, it occurred to me that there might be distinct networking advantages if we could find a suitable Lunar Analog Landscape somewhere in Utah. It took only a few minutes via a Google Search for "Utah Basalt" to lean about the Black Rock Desert area, roughly 140 road miles to the west of Hanksville where MDRS is situated. The BDR includes several discrete areas of lava flows younger than a million years old, in some cases, only a few hundred years old. The areas are clearly noted on my Utah Road Atlas as jumbled or chaotic terrain. The nearest portion lay a few miles west of Fillmore, 150 miles south of Salt Lake City on I-15. I programed myself to pounce on any opportunity to have a look see.

The opportunity I hoped for came and went, or rather disappeared. Then by luck, a replacement crew member let us know that she was renting a car to come down from Salt Lake City two days early, and would I be so kind as to return her rental car? I was only too happy to be so kind, and when it was my time to leave, I took the long way to Salt Lake, making just enough time to take in Fillmore.

As you drive west on a fine-grain gravel road, that I soon realized was paved with crushed lava pumice, all of a sudden you see a black wall in the distance. It is the edge of the lava flow, perhaps 10-20 feet higher than the neighboring terrain. But as I got closer, I could see that the lava flow was liberally dotted with very green foliage of some sort of bush-like plant. Continuing on, I noticed how lumpy the surface was, as if consisting of lava boulders of all sizes placed cheek by jowl. While you could cross it in a tank crushing a new roadway in the process, it looked to me to be extremely difficult for traverses on foot. You couldn't walk more than a few yards without twisting an ankle!

Another oddity. About a third of the clumps were distinctly rust colored, the rest decidedly black. How did that come about? I remain perplexed. I took samples.

The upshot was that with all that vegetation and with the pedestrian unfriendly surface, the site did not seem worth a second look. Are all areas of the Black Rock Desert basalt flows like this? I didn't have time to ask any locals before I had to hustle to make my afternoon flight back home. This first (new) attempt to look for a site was a strikeout. (In 1992, I had the opportunity to tour the pair of lavatubes outside Bend, Oregon then used for the Oregon Moonbase. That site seems in retrospect much more appropriate. We have ample time to continue looking. **PK**

Chapters & Outposts

Bay Area Moon Society Activated

San Francisco - San Jose Metro Area
Meeting the 4th Thursday of Every Month
Contact: Jonathan Andrew Goff - Chapter Leader
http://www.moonsociety.org/chapters/bams/

Our first meeting for 2005 was on February 24th at Bill Clawson's house in Fremont, CA (Bill's wife made a wonderful Spaghetti dinner!). Also present: Jonathan Goff (Santa Clara), Tim Cadell (Santa Cruz), and Rhoda Bryant (Clovis). Not able to attend: Steve Durst (Palo Alto.)

The BAMS website has now been updated after being in stasis for some time. We have gotten a report listing all current and lapsed members living within 60 miles of Fremont, which seems to be central for those of us interested in re-activating BAMS.

Congratulations to Bill Clawson who was elected to the Moon Society Board of Directors on February 16, in a special election to replace two resigned members.

Our next meeting is scheduled for: March 24, 2005 at Bill Clawson's House in Fremont, 7-9 PM. Agenda items for consideration:

1. Revitalizing the Bay Area Moon Society
2. Lofty Goals

Third NSS Chapter to Seek Partner Status?

Report by Peter Kokh

Two moon-focused chapters of the National Space Society have operated as partners of the Moon Society and of its predecessor in member services, Artemis Society International, since the early days of ASI in 1995. They are Oregon L5 Society (Portland) and the Lunar Reclamation Society (Milwaukee.) Now there is the prospect of a third.

While at the Mars Desert Research Station last month, I was approached by my long time friend (18+ years) Ben Huset of Minnesota Space Frontier Society (Twin Cities) about MN SFS seeking a similar relationship. The chapter already has close ties with NSS and the Mars Society. Ben was one of a group of L5 members from the Twin Cities and Chicago who "colonized" the Milwaukee Chapter at a meeting on September 15, 1986. MN SFS is also "an MMM chapter" with its members getting MMM as a membership benefit. So this affiliation would fit right in.

We wish Ben good luck in persuading his fellow MN SFS leaders to embrace such a status. The Moon Society is open to working relationships with like-focused chapters of other organizations, and indeed, with NSS as a whole. The Minnesota chapter has much to offer. We look forward to a show of interest on their part. **<PK>**

GREAT BROWSING !

SMART-1 Photos from the Moon
planetary.org/news/2005/smart1_images_0127.html

USGS Gazeteer of Planetary Geology
http://planetarynames.wr.usgs.gov/

Model of Europa's Ice Crust
http://www.spacemodelsystems.com/europa.html

L5: The High Risk Frontier
http://www.thespacereview.com/article/317/1

Book Review: The Real Mars
http://www.thespacereview.com/article/323/1

Crew Exploration Vehicle Role is __?
http://www.thespacereview.com/article/322/1

Pluto: 75 Years after Discovery
http://www.thespacereview.com/article/319/1

Sacrificing a Gyro may extend Hubble Life
http://www.newscientist.com/article.ns?id=dn7051

Future Unbcertain for Current Astronauts
http://story.news.yahoo.com/news?tmpl=story&cid=1894&e=1&u=/ap/20050306/ap_on_sc/grounded_astronauts

Options for Heavy Lift Vehicles
http://www.thespacereview.com/article/335/1

NASA's Decision to let Hubble Slip Away
http://www.thespacereview.com/article/336/1

Materials for Concrete Lunar Structures
http://uahnews.uah.edu/read.asp?newsID=436

Centennial Prize Money Should be Raised
http://www.space-frontier.org/PressReleases/2005/20050310centennialprize.html

ARC: Alliance to Rescue Civilization
http://www.arc-space.org/

Japan's Selene Moon Probe Project
http://spaceinfo.jaxa.jp/note/tansa/e/tan109_selene_e.html

Mars Desert Research Station WebCam
http://www.freemars.org/mnfan/MarsSociety/2005/MDRS/Crew34/web-cam/

NASA Selects Moon Mapper for Mission of Opportunity aboard India's Chandraayan-1

One additional hurdle to jump, however.

RELEASE: 05-037 - Feb. 2, 2005

NASA chose the Moon Mineralogy Mapper (M3) to fly as part of the scientific payload for the Indian Space Research Organization's (ISRO) Chandraayan-1 mission, slated for launch in 2007. The M3 is designed to create a mineral-resource map of the Moon. It will be flown as part of the Chandraayan-1 mission *if it is selected by ISRO in an independent competition.* The final confirmation of the M3 investigation is subject to successful negotiation of an international agree-ment between NASA and ISRO.

"his experiment will provide detailed maps of the Moon's surface geology and mineral composition for the first time. The M3 investigation also complements the six experiments recently selected by NASA in response to the Lunar Reconnaissance Orbiter (LRO) Announcement of Opportunity. The M3 and LRO investigations support NASA research and exploration objectives for the Moon," he said.

Created in 1992, NASA's Discovery Program sponsors frequent, cost-capped solar system exploration missions with highly focused scientific goals. In July 2004, NASA received 18 proposals in response to an Announcement of Opportunity for Discovery missions and Missions of Opportunity. Proposals were evaluated for scientific merit, technical, management and cost feasibility. M3 was proposed as a Discovery Program Mission of Opportunity.

For information about NASA and agency programs on the Web, visit: http://www.nasa.gov **</MMM>**

Tharsis Books releases New Mars Novel

Glory Be To Mars by Thomas W. Cronin, Ph.

ISBN: 0968750230 PubDate: March 01, 2005
Publisher: Tharsis Books. Hardcover, 471 pages with 5 Mars maps Price: U.S.$25.95, Can$36.95
U.S. Distributor: Baker & Taylor

Tharsis Books announces the upcoming publication of "Glory Be To Mars", an exciting, very fast-paced, stand-alone novel set in 2074, the third novel in a series about the first and only human settlement on Mars.

It is the story of the great war unleashed when a massive U.N. coalition invasion force, led by a vengeful and genocidal rogue general, attacks the well-defended but illegal settlement, and a Martian desert fox makes an unexpected appearance.

For a fuller description and an excerpt, link to the Amazon page for the novel at:
http://www.amazon.com/exec/obidos/tg/detail/-/0968750230/qid=1100495534/sr=1-1/ref=sr_1_1/103-1464184-3507809?v=glance&s=books

Cosmos 1 launch date moved back
Long anticipated Solar Sail to fly in April

Our announced launch period of 1 March to 5 April 2005 has slipped a bit. We now project that Cosmos 1 will launch in April. The testing on the flight spacecraft has gone well, but some corrections and fixes have been required. To enhance reliability, extra precautions have been implemented in both the hardware and software of the spacecraft. We do not rule out other small slips if we take a few extra days here or there in flight preparations, testing or last-minute checks. Unlike launch windows for planetary missions, ours is not fixed by celestial mechanics, so we have much more leeway in setting a date.

http://planetary.org/solarsail/update_20050209.html

Grad Students Study Data on Lunar Water Ice

Lunar Exploration Daily 02/20/2005

Stanford University graduate students in the E235 Space Systems Engineering class are studying data from the NASA Prospector (1998) and Clementine (1994) lunar missions to utilize in situ water ice from the Moon for future human Moon and Mars exploration. In situ water ice on the Moon could have several very important applications for humans on the Moon, such as a source of oxygen, hydrogen used as rocket fuel, and water itself, which could cost US$2,000 - 20,000 per kg to send from Earth.

Lunar Geologist Paul Spudis, who took part in the Clementine study, called the lunar ice deposit possibly "the most valuable piece of real estate in the solar system."

In his 'Manned Moon Mission Orbital Mechanics Trade Study,' which discusses in situ propellant production from water ice on the Moon, E235 graduate student Matt Colgan says Prospector and Clementine detected at least millions of tons of water at the bottom of craters at both the north and south poles. Estimating that 2 tons of liquid oxygen are required for each launch from the lunar surface, Colgan says, "mission requirements will be on the order of hundreds of tons," and concludes that the in situ lunar supplies of water will quench the mission requirements..

Russia plans Mars Isolation Experiment

http://en.rian.ru/rian/index.cfm?prd_id=160&msg_id=5458700&startrow=1&date=2005-03-11&do_alert=0

MOSCOW, March 11 (RIA Novosti) - The Institute of Medical-Biological Problems (Russian Academy of Sciences) has started preparing for a s imulated Martian mission. This experiment will last 500 days,.

Participants will have limited access to information: they will be unable to surf the Internet. Moreover, they will not communicate with the mission-control center on certain occasions. And, finally, the spaceship's crew will be cut off from the rest of the world for several months in a row.

Six volunteers will be selected this fall.

MDRS Crew #36 Red Flyer "ARV" Mission
Tests Robot Aerial Reconnaissance Vehicle

From Matt Turner <maturner@uiuc.edu
PHOTO: http://cobalt.cbqc.net/mdrs/fs04/images/crew36/c36d02arv01.jpg

and ---/fs04/crew36/docs/c36d05dat01.pdf

[MMM: The Red Flyer experiment brought to the **Mars Desert Research Station** in Utah by a crew from the University of Illinois-Urbana, had a serious crash, but not before it had demonstrated the value to future explorers of Mars of a robotic aerial scout. We pick up the report here.]

3/10/05 "Today was a sad day. Late this morning, Randy came upstairs from the work area to inform us that he was not able to fix the structural damage that Red Flyer had sustained in yesterday's landing. Fortunately, it seems that it is only the airframe that is damaged beyond repair and that all of the equipment inside is salvagable. So effectively, the Red Flyer still has its insides intact, it just needs a new shell.

"However the beloved flyer has done it's job. Today Stacy and Amber analyzed the aerial video and have deter-mined that it is rich with geological information, information that they would not have been able to obtain from any other perspective. To verify this, they examined a aerial map (courtesy of USGS) of the area in which we performed our EVA. It was clear that the amount of detail from the Red Flyer's video was far greater than any large scale aerial photo. From only a minute of video they were able to pick out 14 frames of interest. Within these frames seems to be an astonishing amount of geological information, which by their estimation will take them several months to analyze. I personally am exstatic about the results. Even from the preliminary results it seems that we have experimentally verified the benefits of aerial reconnisaince.

"We're planning one more EVA tommorrow before the first phase's crew departs and the second phase begins. During this EVA we will try to get a better idea of what sort of environments an aerial vehicle would have to operate.

"There's a long road ahead of us, but overall, I'd say our mission is becoming accomplished. My last eight months (and endless coming months) seem to be worth it. Even from the beggining it was unclear whether or not this project would work out or not. Operating an aerial vehicle in this sort of extreme environment is risky, and it was very possible that we could've ended up with no data at all. But you can't let that stop you. If everyone did that, humanity would never have advanced to the point it has.

"It was something I wanted to do, and something that I thought could bring about an advance in scientific knowledge. And I, and all of my compatriots did it. I thank everybody who has been involved in this project. We've done something great. Ad Astra." **<MDRS#36/MT>**

Half mile wide meteor put into the impact estimation program at the U. of Arizona Results are Staggering

(Fwd from Birger Johansson)

Thanks to the hard work of Robert Marcus, H. Jay Melosh, and Gareth Collins

Inputs:

Distance from Impact: 40.25 km = 25.00 miles
Projectile Diameter: 1000.00 m = 3280.00 ft = 0.62 miles
Projectile Density: 3000 kg/m3
Impact Velocity: 21.00 km/s = 13.04 miles/s
Impact Angle: 48 degrees
Target Density: 2500 kg/m3
Target Type: Sedimentary Rock

Atmospheric Entry: The projectile begins to breakup at an altitude of 57400 meters = 188000 ft The projectile reaches the ground in a broken condition. The mass of projectile strikes the surface at velocity 20.7 km/s = 12.9 miles/s The impact energy is 3.37 x 1020 Joules = 8.05 x 104MegaTons. The broken projectile fragments strike the ground in an ellipse of dimension 1.69 km by 1.26 km

Crater Dimensions: Crater shape is normal in spite of atmospheric crushing; fragments are not significantly dispersed.
Transient Crater Diameter: 11.7 km = 7.29 miles
Transient Crater Depth: 4.15 km = 2.58 miles
Final Crater Diameter: 16.3 km = 10.1 miles
Final Crater Depth: 0.685 km = 0.425 miles The crater formed is a complex crater.

The volume of the target melted or vaporized is 2.23 km3 = 0.535 miles3. Roughly half the melt remains in the crater , where its average thickness is 20.6 meters = 67.6 feet

Thermal Radiation:

Time for maximum radiation: 0.672 seconds after impact
Visible fireball radius: 13.8 km = 8.56 miles The fireball appears 77.9 times larger than the sun
Thermal Exposure: 9.81 x 106 Joules/m2
Duration of Irradiation: 18.1 seconds
Radiant flux (relative to the sun): 543
Effects of Thermal Radiation: Clothing ignites Much of the body suffers third degree burns. Newspaper ignites. Plywood flames. Deciduous trees ignite. Grass ignites.

Seismic Effects:

The major seismic shaking will arrive at approximately 8.05 seconds.
Richter Scale Magnitude: 7.9 Mercalli Scale Intensity at a distance of 40.25 km:
Air Blast: The air blast will arrive at approximately 122 seconds.
Peak Overpressure: 823000 Pa = 8.23 bars = 117 psi
Max wind velocity: 684 m/s = 1530 mph (Hurricane Charley would be jealous.)
Sound Intensity: 118 dB (May cause ear pain)

Damage Description:

- Multistory wall-bearing buildings will collapse.
- Wood frame buildings will almost completely collapse.
- Multistory steel-framed office-type buildings will suffer extreme frame distortion, incipient collapse.
- Highway truss bridges will collapse.
- Highway girder bridges will collapse.
- Glass windows will shatter.
- Cars and trucks will be largely displaced and grossly distorted and will require rebuilding before use.
- Up to 90 percent of trees blown down; remainder stripped of branches and leaves.

Significance:

There are several asteroids out there, Earth Grazers, that are much bigger than this hypothetical one. I also assumed a stony core instead of an iron one. An iron meteor would be much worse. Also note this is not a planet shaker, it would simply destroy a 75 mile wide area, with much more extensive secondary damage.

It would make Mount Vesuvius look like a minor disaster.

Supposedly, an asteroid this big hits the Earth once every 67 thousand years. It is big enough to remove entire cities from the map. We have the know how and the ability to do something about this threat, but nothing seems to be in the works to begin this program. It would be a shame the first species on this planet, with the ability to control so much of its destiny, got wiped out because of laziness or political ambition.

When are we going to have an asteroid defense system? **<RM/HJM/GC>**

Editor's Comment: While it is certainly true that something like this could happen at any time, people play the odds, and the odds of such an event occurring in our lifetime, or even within the lifetime of the next thousand generations is low.

In contrast, it is virtually certain that most of Canada, much of northern Europe and Russia will be wiped clean off the map by the next ice age, 10-20,000 years off..

And no one is losing any sleep over it!

We have to consider what we can do for how much money and go for good return on our investment. Certainly, identifying and cataloging and keeping track of all the potential offenders is job # 1, and yet something that can be done for trivial amounts of money.

Next, *once we are out there,* in asteroidal space, preferably at some safe distance from home, we can experiment with asteroid trajectory redirection techniques to see what is most effective given various "ETA" warnings from months to many decades. Getting bent out of shape to spend trillions ineffectively is not the answer. **<PK>**

ISDC 2005 - MAY 19-22, 2005 WASHINGTON DC

http://isdc.nss.org/2005/
"Your Ticket to Space"

DOZENS OF SESSIONS on space science, technology, policy, commerce, exploration, and more, all focused on bringing ever closer the vision of spacefaring civilization.

Confirmed Speakers include: Craig Steidle, Burt Rutan, Steve Squyres, Peter Diamandis. Gala dinner at Smithsonian Udvar-Hazy Center for NSS 30th anniversary.

Schedule: Full days of conference tracks on Thursday through Saturday (May 19-21), and a half-day Sunday AM (May 22). Opening reception Wednesday PM (May 18).

Tracks and Sessions (what follows is the barest outline:
For the full Call For Papers listing go to:
http://isdc.nss.org/2005/cfp.html

1) Government sector track - Education - History - Law & policy - Moon, Mars & Beyond
2) Private sector track - Commerce & Space businesses - Finance - Lobbying - Media & entertainment - Suborbital & FAA/AST - Spaceports - Space tourism & experiences - Vehicles & hotels
3) Science track - Astrobiology/Exobiology - Earth science - Lunar science - Mars science - Near Earth Objects & planetary defense - Saturn science - Space medicine & physiology. - (Interstelar) Space science.
4) Settlement track - Developments in Lunar settlement concepts. - Developments in Mars settlement concepts - L5 & other. Developments in other space settlement concepts
5) Technology track: Agriculture & Life support - Computers, communications & software - Open source software - Power & propulsion - Resource utilization - Space elevator - Nanotechnology
6) Teen programs - Space arts competition. Present your music, poems, short stories, paintings, films, public service announcements.

Presenter Deadlines: March 1 Abstract deadline has passed: Title: text, up to 12 words. Abstract: text, 300-500 words. **Manuscript deadline:** Friday, April 22, 2005)

Hotel: The Sheraton National Hotel is located just across the Potomac River from downtown Washington DC in Arlington, Virginia. The hotel has a **free shuttle to and from Reagan National Airport** as well as the **Metro subway system**, making it an ideal place to stay not just for the conference but for any additional sightseeing in the Washington area. Visit the conference hotel web site for more information about the hotel and to book a room at the special conference rate of **$109/night**.

https://starwoodmeeting.com/Book/nss

Conference Registration: it's always the most economical option to register for one ISDC at the one prior. These rates are for those who haven't done so. **Before/after April 30: NSS Member rates:** Adults $150/175 - Senior/ Student $125/150 - **Non-member rates:** Adults $200/250 - Seniors/ Students $150/175

Lunar Reclamation Society, Inc.

P.O. Box 2102
Milwaukee
WI 53201

www.lunar-reclamation.org

Ad Astra per Ardua Nostra
To the Stars through our own hard work!

New list - 2004 LRS OFFICERS / Contact Information

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LRS News

• **Feb. 6-20:** Peter was part of MDRS Crew #34 at the Mars Desert Research Station in Utah, and reported on his experiences, impressions, & findings at the March meeting.

• **Mar. 4-6:** Peter was the guest of the Minnesota Space Frontier Society Chapter at the MarsCon Science Fiction Convention where he spoke about the Mars Desert Station.

LRS MARCH & APRIL Events

Saturday, APR. 9 th, 1-4 pm

LRS Meeting, Mayfair Mall, Garden Suites Room G110
AGENDA: www. lunar-reclamation.org/page4.htm

- **Space Updates:** Cassini's exploration of Saturn's moons andthe Huyghens probe's discoveries on Titan; NASA's plans for next Shuttle flight; The Space Station: Private Enterprise projects in the works
- **Plans for renting MDRS; The 2005 space Calendar**

Saturday, May 14 th, 1-4 pm

LRS Meeting, Mayfair Mall, Garden Suites Room G110
AGENDA: www. lunar-reclamation.org/page4.htm

ANNOUNCING NEW 1st TUESDAY PM Gatherings

In the early days of the chapter, we had a second casual gathering at Mayfair Mall on an evening weeknight. Now, in conjunction with www.meetup.com, the "Milwaukee Space Exploration Grouo" will start meeting there at 8 pm on the 1st Tuesday of the month. You are all welcome!

http://space.meetup.com/28/events/4334116/

U.S. CHAPTERS

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MMM
6 Chapters Strong

Space Chapters HUB Website:
[http://nsschapters.org/hub/]

MINNESOTA

Minnesota Space Frontier Society

c/o Dave Buth 433 South 7th St. #1808
Minneapolis, MN 55415

Tom Greenwalt (w) 763-784-6244 (h) 763-442-6015
David Buth (w) (612) 333-1872, (h) (763) 536-1237
Email: tomg@mnsfs.org **[www.mnsfs.org/]**

MN SFS News & Pictures

• **February 8th Meeting:** Brookdale Public Library (6125 Shingle Creek Pkwy, Brooklyn Center. Subject: Cassini/ Huygens update, focusing on the remarkably successful Huygens probe and what it has discovered.

• **February 22 Movie Night:**"Destination Moon" was shown.

• **March 4-6 MarsCon Pix:**
http://marvin.freemars.org/mnfan/marscon/2005/

• **BESN 2005 pics**
http://www.freemars.org/mnfan/BESN/2005/

• **March Meeting Pics**
http://www.freemars.org/mnfan/mnsfs/2005-March/

• **MN SFS Award Winners:** Recipients of a Certificate of Achievement/prize packet from MN SFS for their projects.
* John Quandt - Model Rockets Speed/Acceleration 6037W
* Joseph Edwards & Brian Gooley - Wassup? Impact of Wing Angle on Lift 7133W
* Chase Haider - Parachuets 8047S
* Maria Bollensen - Hot Air Balloons: Just a Lot of Hot Air? 8051T
* Sean Luna - Can you Build a Hovercraft? 8058T
* Abigail Wold - Does Number of Sides Affect Structure Strength? 8071S
* Kayla Benson - Electromagnets 8086T
* Kyle Randolph - Determining Payload Mass in a "Box Kite" Tumbleweed Rover 1040T

Thanks to NASA Glenn Research Center, MN Space Frontier, MAS, and Radio City who contributed to the prize packets. Thanks to Craig Borchard for helping judge this year's enterants. pics at
http://www.freemars.org/mnfan/tcrsf/2005/

OREGON

Oregon L5 Society

P.O. Box 86, Oregon City, OR 97045

voice mail / (503) 655-6189 -- FAX (503)-251-9901
[http://www.OregonL5.org/]
Allen G. Taylor <allen.taylor@ieee.org>
Bryce Walden <moonbase@comcast.net>
(LBRT - Oregon Moonbase) moonbase@comcast.net

Meetings 3rd Sat. each month at **2 p.m.**
Bourne Plaza, 1441 SE 122nd, Portland, **downstairs**
Mar 19 - Apr 16 - May 21

WISCONSIN

Sheboygan Space Society

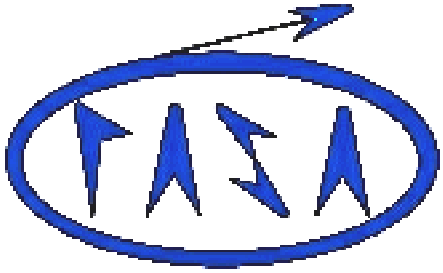
728 Center St., Kiel WI 54042-1034

c/o Will Foerster 920-894-2376 (h) <willf@tcei.com>
SSS Sec. Harald Schenk <hschenk@excel.net>
>>> DUES: "SSS" c/o B. P. Knier
22608 County Line Rd, Elkhart Lake WI 53020
[http://www.tcei.com/sss/]

We meet the **3rd Thursday** of the month at **7-9pm**

MAR. 17th: UW-Sheboygan, Room 6101, **Sheboygan**
APR. 21st The Stoelting House, **Kiel**
MAY 19th: UW-Sheboygan, Room 6101, **Sheboygan**

PENNSYLVANIA



Philadelphia Area Space Alliance

PO Box 1715, Philadelphia, PA 19105

c/o Earl Bennett, EarlBennett@erols.com
215/633-0878 (H), 610/640-2345(W)
[http://pasa01.tripod.com/]

PASA regular business luncheon/formal meeting from **1-3 pm**, the **3rd Saturday** of every month at the **Liberty One** food court on the second level, 16th and S. Market. Go toward the windows on the 17th street side and go *left*. Look for table sign. Parking at Liberty One on 17th St. Call Earl or Mitch 215-625-0670 to verify all meetings.

NEXT MEETINGS: Mar 26th (4th Sat.) - **Apr 16 – May 21at**

- **February 20th Meeting Notes:** We had a good, well attended and fun meeting. Michelle Baker, a past President, Treasurer, instructor and all around supporter of the promotion of human advancement into space as part of our group and also currently an Ambassador to the Solar System (J.P.L.) joined us as a friend of mine and also to enjoy a special presentation. We also had attendance by our newest member, Ernst Hohmann, who own an aeronautics company, and is interested in "the other side of the sky" to possibly slightly misquote him. The special presentation was by Gary Fisher, of both The Mars Society, and another group he is working as Treasurer: The Mars Homestead Project. This meeting was pure gravy.

Highlights: Our new member Ernst discussed his interest in space in general and gave us several stories of important events he personally related to: Like the time on a particular date in 1957, when he awoke to talk of an important announcement of a space launch. He thought "I wonder if the Americans have launched Vanguard ?". Since he was in Germany, West Germany at that time, he was listening to various broadcasts and was surprised to learn that it was the Soviets that had done it. It turns out that they had announced the attempt, but in keeping with their style of doing things, it was buried as a small, not very impressive note in Tass (an official paper of the U.S.S.R.). He was a young, working, man at that time and remembered the excitement, and not a little fear from some U.S. reports, that this event engendered. Welcome Ernst!

Our second major special occasion was the result of member Gary Fisher receiving a special Birthday Present: Gary's' wife decided to give him a Mars-like experience by booking him on what we know as "The Vomit Comet"! Gary's' D.V.D. of the event was an absolute delight to our member and guests who loved the different shenanigans of the people on the flight. This included Gary's' "suddenly standing up on Mars" experience (quick trip to the ceiling of the aircraft) and use of the opportunity to flash a "Mars Homestead Project" placard in front of the camera. We'll get clips for our website. Additionally you get the chance to experience "dangerous Lunar Gravity" per Gary (laughed at by our current and former Moon Society members) and high accelerations as the aircraft altered its trajectories to create: Mars, Lunar, and Zero Gravity effects. This course shifting included two "gravity" forces on the passengers (~30 if memory serves). this was a wonderful presentation.

But Wait, there's' more! o.k. it sounds like a famous commercial, but its true. Gary also brought a small D.V.D. produced by a member of a crew at The Mars Desert Research Station in Hanksville, Utah. This was a very good production that gave a really good tour of duty at the station including the trials and tribulations of maintaining power, from diesel generators, and the delight of working with the hab and its equipment. Note that the solar panels kept working. A number of shots where of Gary's contribution: the greenhouse system (part of the work towards a Closed Loop Environmental Support System, or "CLESS". Gary and his son(s) built this in our area, Southeastern Pennsylvania, and personally drove the parts to Arizona for installation. But I ramble on. We really enjoyed this "double feature" from Gary and roundly applauded him. Thank you Gary. He also gave us an item to present to the winner of the Elementary Division of the George Washington Carver Science Fair at the end of March. Again, thank you Gary.

We had good attendance for this meeting even with our normal stalwarts, Dorothy and Larry being unable to attend. Several other members who normally are unable to come Saturdays' where also unable to come but, because we did Sunday, we did get Ernst who had been busy Saturday.

Mitch Gordon reprised us with material from several sources including: the "Winter" **Ad Astra**. including noting the "Terraforming Venus" article previously (last month) noted. In addition he brought the current issue of The Futurist the publication on The World Future Society which contained a N.A.S.A report on Policing the Future by Gene Stephens describing the use of image detection and enhancement with techniques developed for space and other, more classified applications. Nice illustrations.

Still more: the March issue of Popular Science has the article: "Space Hotel, 2010". This is a partially inflatable, partially solid ;) design that Robert Schnider and space activist Robert Branson. Mr. Branson is a billionaire so this could happen. Private Enterprise! On other fronts: Mitch did public outreach to the university city libraries via some of our cards and hand outs. the other significant thing he will have done this week (2/23) is to give a presentation on setting up an urban "Think Tank" for Philadelphia area non profits. He is hoping to work this out so that the universities will encourage student involvement as part the universities public outreach programs. All boats rising He also suggested that Gary Fisher give his Mars Homestead talk at a college here to bring students into our groups. Go Mitch!

Our next report was from Hank Smith detailing some future science fiction oriented conventions as well as bring up talk of The International Space Development Conference which will be held May 19 to 22nd. This event will probably be attended by half or more of our members. These are great event and we had discussed trying for one with Jeff Liss of the events parent organization, N.S.S., but realized we needed a substantial core membership to do this. The ISDC is actually coming off of another event: Balticon a major east coast convention that will again be attended by Hank and a number of members. Hank will probably be a volunteer at this as he has at many others. This convention has a very good hard science track as well as fiction. Two week vacation anyone? Note that Balticon is near Baltimore and not too close to Washington. Speaking of

2010, Hank also talked of a possible North American Science Fiction Convention, or "Nasfic" in Philadelphia for fans who would not be going to the World Con overseas. He gave us the sad news too that author Jack Chalker had passed away recently. we've lost a number of good people recently. Onward!

Due to the excellent presentation by Gary and the introduction of Ernst the Technology report was not given by Earl Bennett at the meeting. Due to the needs of work I have not ranged as far as I normally do (a cheer goes up....) but did find some interesting material with applications to space exploration and designed for space exploration. The first piece was written in Sensors Magazine which had a wealth of articles, especially on wireless networks, but Silicon Carbide Microsensors for Demanding Applications caught my eye. I have previously ran across this material for special microwave power devices, that could be used in satellite communications and aircraft equipment, as well as high reliability power systems. The authors,Jeffrey M. Melzak and Chien-Hung Wu of FLX Micro are working on the material for mechanical systems that could operate in hazardous conditions of all kinds.It is a detailed article including comparing this material to an "old favorite": Diamond. In some circumstances, say building a Sun Diver Probe, Diamond could do the job of forming electronics to operate in that regime, but for many other "Down Well" (gravity and geologic) the Silicon Carbide would be better. This is due to its more favorable resistance to corrosive, fracture resistance and other mechanical attributes. Both materials are also semiconductors and both are being developed to build electronic circuitry.You could build the control circuitry for a function and the actual mechanical system on one piece of material here. Seethe magazine for February 2005 starting on page 29 (www.sensormag.com, an Advanstar publication) From NASA Tech Briefs, which is from Associated Business Publications Co., Ltd. had several "dirt side" and space oriented reports. Briefly: see "Energy Technologies for a Clean Future" starting on page 14, and several individual report shorts including "digital Receiver for Microwave Radiometry" which is about adding a signal processor to screen out interference along the signal path (for signal recovery in the presence of on channel interference) by a team from Ohio State University. Page 36 ff.

On other matters: The George Washington Carver Science Fair, Senior Division, will occur between March 2nd and 5th (judging and subsequent award presentation) with the elementary division almost at the end of March. This should be fun for Mike Fisher, Gary Fisher & Earl Bennett..

For Super Science Weekend I may be the lone presenter for our group. Michelle Baker may help part of the time, depending on her other commitments.

And it should be noted that Janice, our long attending guest non member, may have an article in MMM

Earl Bennett. All omissions and errors are mine.

Postscript: On Friday March 11th PASA presented the Oscar Howard Harris Award for Space Related Science and Technology to Zachary Powers for his "An Anthropomorphic Robot Hand" that he is developing. I have pictures and will practice putting things on a C.D. to mail them to our web-master Larry. With any luck we can have them on our site by the time of our March 26th meeting.

We gave Zachary several gifts both from me and the organization and, thanks to a gift from Gary Fisher, membership both in PASA and an introductory one to our flagship The National Space Society. I made the checks and envelopes out to the organizations so all he needs to do is put his address on the return part of the envelope and send them. I also gave him a check from PASA for $ 30.00 toward more robotic parts. I initially had thought to give him a book store card but decided that he might want to implement his own ideas and the check would help towards that. I applied $ 5.00 toward his PASA membership thus using up the $ 35.00 drawn from our treasury.

The next event in the fair series will occur towards the end of the month with the elementary awards in April.

Also: one of our members, Mike Fisher, judged for M.E.N.S.A. and picked a bright young women as that groups award winner. Peter Stevens (Hi Pete!) was to present the award but was substituted for by a women who I believe was also a member of MENSA and Carver Committee member. I did not get a picture of that presentation but there was an official photographer with excellent equipment so that a good publicity image (digital camera) could be had via the fair committee. Earl Bennett, President, PASA

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oasis@oasis-nss.org
Odyssey Newsletter Online
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Regular Meeting 3 pm 3rd Sat. each month
Microcosm, 401 Coral Circle, El Segundo.

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- **Mar. 19th, 3pm -- Apr. 16th, 3 pm -- May21st, 3 pm**
- **May 19-22 ISDC** in Washington DC

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Send proper dues to address in chapter news section

=> for those outside participating chapter areas <=

❍ $15 Individual Subscriptions to MMM/MMR: Outside North America ❍ $50 Surface Mail -- Payable to "LRS", PO Box 2102, Milwaukee WI 53201

CHICAGO SPACE FRONTIER L5

❍ $15 annual dues

LUNAR RECLAMATION SOC. (NSS-Milwaukee)

❍ $15 reg. ❍ $20 family ❍ $12 student/senior

MINNESOTA SPACE FRONTIER SOCIETY

❍ $25 Regular Dues

OREGON L5 SOCIETY

❍ $25 for all members

O.A.S.I.S. L5 (Los Angeles)

❍ $25 regular dues with MMM

PHILADELPHIA AREA SPACE ALLIANCE

❍ Annual dues for all with MMM $20, due in March or $5 times each quarter before the next March

SHEBOYGAN SPACE SOCIETY (WI)

❍ $15 regular, ❍ $10 student,
❍ $1/extra family member
"SSS" c/o B. P. Knier, 22608 County Line Rd, Elkhart Lake WI 53020

Moon Miners' MANIFESTO

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